- through full sternotomy: the Brigham and Women's Hospital experience. *Ann Cardiothorac Surg*. 2015;4:38-48.
5. Ghanta RK, Lapar DJ, Kern JA, Kron IL, Speir AM, Fonner E Jr, et al. Minimally invasive aortic valve replacement provides equivalent outcomes at reduced cost compared with conventional aortic valve replacement: a real-world multi-institutional analysis. *J Thorac Cardiovasc Surg*. 2015;149:1060-5.
 6. Johnston DR, Atik FA, Rajeswaran J, Blackstone EH, Nowicki ER, Sabik JF III, et al. Outcomes of less invasive J-incision approach to aortic valve surgery. *J Thorac Cardiovasc Surg*. 2012;144:852-8.e3.
 7. Hawkins RB, Ailawadi G. Institutional or individual experience matters in minimally invasive valve surgery. *J Thorac Cardiovasc Surg*. 2016;152:1477-8.
 8. Holzhey DM, Seeburger J, Misfeld M, Borger MA, Mohr FW. Learning minimally invasive mitral valve surgery: a cumulative sum sequential probability analysis of 3895 operations from a single high-volume center. *Circulation*. 2013;128:483-91.
 9. Nishimura RA, Otto CM, Bonow RO, Carabello BA, Erwin JP III, Fleisher LA, et al. 2017 AHA/ACC focused update of the 2014 AHA/ACC guideline for the management of patients with valvular heart disease: a report of the American College of Cardiology/American Heart Association task force on clinical practice guidelines. *J Am Coll Cardiol*. 2017;70:252-89.

<https://doi.org/10.1016/j.jtcvs.2019.01.052>

MINIMALLY INVASIVE CARDIAC SURGERY AND THE IMPORTANCE OF QUALITATIVE PATIENT-CENTERED METRICS TO GUIDE INNOVATIONS

Reply to the Editor:

As transcatheter aortic valve replacement (AVR) has grown, and the benefits of percutaneous techniques have been realized, surgeons have explored less invasive approaches to perform surgical AVR (SAVR). Some argue that minimally invasive SAVR is the optimal approach, because it minimizes surgical trauma while achieving complete resection of a diseased aortic valve, as opposed to crushing it by transcatheter AVR deployment.¹ Interestingly, a recent randomized trial by Nair and colleagues² demonstrated no apparent clinical benefits with minimally invasive SAVR at the expense of increased costs. The results of that study and Fedak's recent editorial³ have fueled further debate as to whether there is any advantage to minimally invasive techniques at all.

The letter by Percy and colleagues is of particular interest. We agree with the argument that it is difficult to show differences in safety and efficacy outcomes between ministernotomy and full sternotomy AVR. In experienced hands, both approaches are likely safe and effective when compared for traditional clinical end points. We must be cautious, however, and not dismiss emerging unvalidated minimally invasive techniques if they fail to demonstrate superiority when assessed by these end points. Qualitative measures may be important to assess further the values, beliefs, and attitudes of patients who must choose from a variety of interventions, including transcatheter AVR.

More qualitative outcome measures, such as pain, functional disability, and overall patient satisfaction, may be more valuable to assess the subtle but still relevant differences between equally safe and effective operative techniques. We must encourage such end points in the design of our clinical studies to evaluate minimally invasive approaches. The time to full physical and mental recovery after open- surgery is meaningful to patients but often underappreciated by caregivers. Much of the limitation to early functional recovery after SAVR involves activity restrictions related to sternal precautions. These restrictions limit mobility, activity, return to work, and patient satisfaction. The right anterior minithoracotomy approach for mini-SAVR is established and described.⁴ In our growing experience with right anterior minithoracotomy, we find that patients have minimal postoperative pain, need infrequent blood transfusion, and are often discharged early. By avoiding sternal precautions, they can return to physical activity much earlier. To date, experience with this technique is limited, and robust outcome data are lacking, but reports from high-volume centers with expertise in right anterior minithoracotomy are encouraging.⁵

Avoiding sternal precautions is an important goal to achieve after SAVR. This simple and straightforward patient-centered target may have the greatest potential to accelerate functional recovery and provide optimal patient satisfaction. We will develop a rigorous multimodal research platform to explore innovations to enhance and accelerate recovery after heart surgery. Our work will be guided by qualitative outcomes as primary end points. We use a right anterior mini thoracotomy approach for mini-SAVR for complete sternum sparing, which facilitates enhanced functional recovery. For redo operations or for those patients who are not candidates for mini-SAVR, we continue to develop adhesive-enhanced sternal closure methods, with a novel bone adhesive compound to achieve rapid bony stabilization and eliminate the need for sternal precautions (NCT03365843).^{6,7}

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References

1. Glauber M, Miceli A. Minimally invasive aortic valve replacement with sutureless valve is the appropriate treatment option for high-risk patients and the "real alternative" to transcatheter aortic valve implantation. *J Thorac Cardiovasc Surg*. 2016;151:610-3.

Dr Kent receives personal fees from LivaNova. Dr Fedak has nothing to disclose with regard to commercial support.

Author has nothing to disclose with regard to commercial support.

- Nair SK, Sudarshan CD, Thorpe BS, Singh J, Pillay T, Catarino P, et al. Mini-Stern trial: a randomized trial comparing mini-sternotomy to full median sternotomy for aortic valve replacement. *J Thorac Cardiovasc Surg*. 2018;156:2124-32.e31.
- Fedak PW. Make sternotomy great again. *J Thorac Cardiovasc Surg*. 2019;156:2133-4.
- Lamelas J. Minimally invasive aortic valve replacement: the "Miami method" *Ann Cardiothorac Surg*. 2015;4:71-7.
- Glauber M, Miceli A, Gilmanov D, Ferrarini M, Bevilacqua S, Farneti PA, et al. Right anterior minithoracotomy versus conventional aortic valve replacement: a propensity score matched study. *J Thorac Cardiovasc Surg*. 2013;145:1222-6.
- Fedak PW, Kieser TM, Maitland AM, Holland M, Kasatkin A, Leblanc P, et al. Adhesive-enhanced sternal closure to improve postoperative functional recovery: a pilot, randomized controlled trial. *Ann Thorac Surg*. 2011;92:1444-50.
- US National Library of Medicine. NCT03365843: Montage-Enhanced Sternal Closure. Available at: <https://clinicaltrials.gov/ct2/show/NCT03365843>. Accessed May 1, 2018.

<https://doi.org/10.1016/j.jtcvs.2019.02.018>

MORE EVIDENCE FAVORING BIOPROSTHESES FOR PATIENTS OLDER THAN 55 YEARS IN AORTIC VALVE REPLACEMENT

To the Editor:

I read with great interest the recently published meta-analysis of Diaz and colleagues,¹ which establishes that relative to biologic valves, mechanical prostheses provide a survival benefit for patients aged 50 to 70 years who undergo aortic valve replacement (4886 patients from 5 studies).

I believe that this study has a number of important limitations that should be highlighted. The first one is due to its design. The protocol that was published in the PROSPERO database (registry number CRD42017076611) established as inclusion criteria only propensity score-matched (PSM) studies or randomized controlled trials. This design prevented the inclusion of the study by Goldstone and associates,² the largest study published to date (9942 patients), because confounding variables were controlled by inverse probability-weighted cohorts. This work showed no differences in survival for patients older than 55 years. Likewise, age subgroup analysis were not carried out with this age cutoff in the meta-analysis.

It is important to note that the use of propensity score matching can only control for previously measured and registered variables. Unmeasured or unknown factors thus may still be different between groups after matching. These confounding factors could potentially introduce bias favoring the mechanical group, because surgeons tended to implant bioprostheses in patients younger than 65 years

only if those patients are considered frail candidates (those with a reduced life expectancy, high comorbidities, or contraindication for anticoagulation) or in cases of patient preference.

Importantly, there must be factors that influence the risk of structural valve degeneration or thrombosis, or that affect the control of anticoagulation. In this sense, the percentage of international normalized ratio self-monitoring (which reduces international normalized ratio variability and clinical events),³ the type and size of implanted prosthesis, or a diet rich in vegetables, such as the Mediterranean diet, thus are factors that have not yet been properly studied. I therefore believe that knowing the real-world results in different regions or countries provides more knowledge than a weighted average of all the studies, because the environment exerts an influence impossible to quantify.

Recently, my group has led the Andalousian Aortic Valve Multicentric (ANDALVALVE) Study,⁴ a multicentric retrospective study including all subjects aged 50 to 65 years who underwent primary isolated aortic valve replacement for severe aortic stenosis at all hospitals within Andalusia, Spain (population, 8,500,000 people) between 2000 and 2015. A total of 1443 patients were enrolled. After propensity score matching, our study showed similar long-term survivals for patients older than 55 years. A National extension comprising 30 hospitals in Spain is underway (SPAVALVE, [ClinicalTrials.gov](https://clinicaltrials.gov/ct2/show/study/NCT03595423) NCT03595423)).

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References

- Diaz R, Hernandez-Vaquero D, Alvarez-Cabo R, Avanzas P, Silva J, Moris C, et al. Long-term outcomes of mechanical versus biological aortic valve prosthesis: systematic review and meta-analysis. *J Thorac Cardiovasc Surg*. November 20, 2018 [Epub ahead of print].
- Goldstone AB, Chiu P, Baiocchi M, Lingala B, Patrick WL, Fischbein MP, et al. Mechanical or biologic prostheses for aortic-valve and mitral-valve replacement. *N Engl J Med*. 2017;377:1847-57.
- Baumgartner H, Falk V, Bax JJ, De Bonis M, Hamm C, Holm PJ, et al; ESC Scientific Document Group. 2017 ESC/EACTS guidelines for the management of valvular heart disease. *Eur Heart J*. 2017;38:2739-91.
- Rodríguez-Caulo EA, Macías D, Adsuar A, Ferreiro A, Arias-Dachary J, Parody G, et al. Biological or mechanical prostheses for isolated aortic valve replacement in patients aged 50–65 years: the ANDALVALVE study. *Eur J Cardiothorac Surg*. 2019; <https://doi.org/10.1093/ejcts/ezy459> [Epub ahead of print].

<https://doi.org/10.1016/j.jtcvs.2019.01.115>